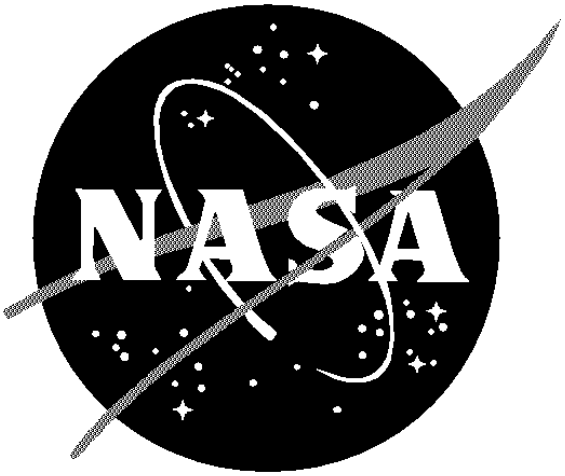

National Aeronautics and Space Administration

October 11, 2002

NRA-02-OES-05

RESEARCH ANNOUNCEMENT

RESEARCH OPPORTUNITIES FOR PRECIPITATION MEASUREMENT MISSIONS

Notice of Intent Due November 12, 2002

Proposals Due December 12, 2002

OMB Approval No. 2700-0087

RESEARCH OPPORTUNITIES FOR PRECIPITATION MEASUREMENT MISSIONS

NASA Research Announcement
Soliciting Research Proposals
for
Period Ending
December 11, 2002

NRA 02-OES-05
Issued October 11, 2002

RESEARCH ANNOUNCEMENT

RESEARCH OPPORTUNITIES FOR PRECIPITATION MEASUREMENT MISSIONS

The NASA's vision is

To improve life here,
To extend life to there,
To find life beyond.

The NASA mission is

To understand and protect our home planet
To explore the universe and search for life
To inspire the next generation of explorers
....as only NASA can.

INTRODUCTION

The National Aeronautics and Space Administration (NASA) announces the solicitation of research proposals to conduct scientific investigations in Precipitation Measurement Missions consistent with the science goals of NASA's Earth Science Enterprise (ESE).

The mission of NASA's ESE is to develop a scientific understanding of the Earth system and its response to natural or human-induced changes to enable improved prediction capabilities for climate, weather, and natural hazards. The Earth science research program aims to acquire a deeper understanding of the Earth system by describing how its component parts and their interactions have evolved, how they function, and how they may be expected to continue to evolve on all time scales. The challenge is to develop the capability to predict those changes that will occur in the future, both naturally and in response to human activity. These interactions occur on a continuum of spatial and temporal scales ranging from short-term weather to long-term climate scales, and from local and regional to global scales. The Enterprise also seeks to provide accurate assessments of changes in the composition of the atmosphere, the extent and health of the world's forest, grassland, and agricultural resources, and geologic phenomena that can cause natural hazards.

The Enterprise aims to provide scientific answers to five generic Earth system science problems:

1. ***Natural Variability:*** *How is global Earth system changing?*
2. ***Forcing Factors:*** *What are primary forcing factors of Earth system?*
3. ***Disturbances:*** *How does Earth system respond to natural & human-induced changes?*
4. ***Consequences:*** *What are consequences of change in Earth system for human civilization?*
5. ***Prediction:*** *How well can we predict future changes in Earth system that will take place in future?*

Over the past decades, NASA has made major investments in space-based and sub-orbital observations, model development, and infrastructure and research, all conducted by the broad

scientific community to address these scientific issues. In particular, NASA and its partner agencies launched the Tropical Rainfall Measuring Mission (TRMM) in November 1997, QuikScat in June 1999, the Terra (EOS-AM) mission in December 1999, the Aqua (EOS-PM) mission in May 2002, and will soon follow with the launch of ICESat. These missions and their associated research investigations and field campaigns, are expected to usher in a new era of integrated scientific studies of the Earth system, as envisioned in the original plans for EOS and the now emerging Climate Change Research Initiative (CCRI).

A central objective of NASA's ESE is the understanding of precipitation variability and its relationship to the Earth's water cycle, weather disturbances, and climate change. Therefore, investigations focusing on the impact of precipitation variability on specific processes within the atmospheric and/or surface water cycles, water budgets and their closure, the rate of water cycling through the atmosphere and surface, and the relationships of linked precipitation-water cycle processes on weather and climate through both forcing and feedback are all important research topics under this NRA.

Studies along these lines may involve either observational analyses or the use of satellite precipitation observations in modeling. Modeling-based studies addressing innovative schemes to improve simulations of climate, precipitating storms, hydrology, hydrometeorological interactions, and marine boundary layer processes are also welcome.

Improving the accuracy of short-term weather and hydrometeorological predictions and increasing the period of validity of long-range forecasts through use of satellite precipitation measurements are of great interest to this research program. While routine weather, climate, and hydrological predictions are the primary responsibility of operational agencies such as National Oceanic and Atmospheric Administration (NOAA) and United States Geological Survey (USGS), scientific advances leading to the development of more accurate operational forecast models, as well as new and more effective methods for assimilating satellite rainfall observations into such models, would be considered directly responsive. The principal thrusts of ESE cooperation with operational forecasting services are: (1) participation in the development of precursor operational instruments for application to various operational environmental satellite systems, (2) development of new data products originated from space-based observing systems, (3) collaboration in the development of land-atmosphere and ocean-atmosphere models and their associated data assimilation schemes, and (4) participation in relevant field campaigns.

This research program will focus primarily on scientific investigations related to current satellite observations of precipitation using measurements from, but not limited to, the Tropical Rainfall Measuring Mission (TRMM), launched in November 1997. The current TRMM science research program consists of a broad range of investigations covering modeling and analysis, algorithm improvements, validation, applications, and outreach efforts, primarily associated with TRMM and other precipitation-related missions and instruments. For information on TRMM see http://trmm.gsfc.nasa.gov. A secondary focus of this announcement is research related to future precipitation missions, such as the next generation constellation-based Global Precipitation Measurement (GPM) Mission, now in its formulation phase. The advanced mission research focuses on the development of science requirements, new analysis and modeling techniques, and new retrieval schemes needed for the future, especially related to extension of TRMM-like observations into middle and high

latitudes. For information on GPM see http://gpmscience.gsfc.nasa.gov. These activities are part of NASA Global Water and Energy Cycle as part of the U.S. Climate Change Research Program.

This opportunity, which follows earlier TRMM research announcements in 1993, 1996, and 1999, is intended to support precipitation mission-related investigations for a 3-year period.

Proposers should be aware that research supported by this NRA is expected to be responsive to six specific scientific questions related to precipitation and the global water cycle as addressed within ESE's broad scientific strategy. This strategy has been articulated in ESE (2000) [see document *Earth Science Enterprise Research Strategy*, available from National Aeronautics & Space Administration (NASA), Washington, DC, found at web site http://www.earth.nasa.gov/visions/index.html , and discussed in the article by Asrar et al. (2001) [see Asrar, G., J.A. Kaye, & P. Morel, 2001: NASA research strategy for Earth system science: Climate component. *Bull. Amer. Meteorol. Soc.*, **82**, 1309-1329]**.** The six scientific questions alluded to above consist of the following:

1. *How are global precipitation, evaporation, and the cycling of water changing?*
2. *What are the effects of clouds and surface hydrologic processes on Earth's climate?*
3. *How are variations in local weather, precipitation and water resources related to global climate variation?*
4. *How can weather forecast duration and reliability be improved by new space observations, data assimilation, & modeling?*
5. *How well can transient climate variations be understood and predicted?*
6. *How well can long-term climatic trends be assessed and predicted?*

A total of approximately $18 million is expected to be authorized and appropriated by the U.S. Administration and Congress for three years (i.e. FY 03-05) to support these science investigations, subject to availability of funds. It is anticipated that an average NASA award will be in the range of $100,000 to $150,000 per year, although larger awards are possible contingent upon their relationship to the research themes listed in Appendix A of this NRA. Approximately 90% of the funded research will be related to efforts utilizing currently available satellite data such as from NASA Satellites (e.g. TRMM, Aqua, QuikScat, GRACE, etc.) or satellite data to be available during the next two years. NASA may consider selecting additional highly meritorious proposals that receive excellent to very good rating in peer review subject to availability of additional funds.

Participation in this program is open to all categories of domestic and foreign organizations, including educational institutions, industry associations, non-profit institutions, NASA field centers, and other U.S. government agencies. In accordance with NASA policy, all investigations by foreign participants will be conducted without any exchange of funds, i.e., NASA cannot fund investigators whose home institution is outside the United States. Likewise, those investigations requiring NASA foreign partners or commercially available satellite observations, should identify them and their associated costs in their proposal.

NASA's Earth Science Enterprise has adopted commercial data purchases as a mainstream way of acquiring research-quality data, as these commercial capabilities become available.

NASA encourages the use of commercially available data sets by Principal Investigators as long as it meets the scientific requirements and is cost-effective. When responding to a NASA Research Announcement the proposer should identify the commercial data sources intended for use and the associated cost.

Proposals may be submitted at any time during the period ending December 12, 2002. NASA reserves the right to consider proposals received after that date in accordance with Appendix B, paragraph 11(g) i.e., "the selecting official deems the late proposal to offer significant technical advantage or cost reduction." Proposals submitted to NASA will be evaluated through a scientific peer review. Selection is expected to be announced by April 2003.

All prospective proposers are strongly encouraged to submit a notice of intent to propose to this NRA by November 12, 2002. This notice should contain the anticipated title of the proposed research project, a brief description of the proposed research, name(s) of the PI and any other co-Investigator(s), as well as contact information for each investigator including institutional affiliation, mailing address, telephone #, fax #, and email address (see Appendix E).

Technical information contained in Appendix A applies to this NRA only.

Appendices B through D contain general NASA guidelines for the preparation of proposals solicited by this announcement.

Identifier:	NRA 02-OES-05
Submit Notice of Intent to:	**Conventional Mail**: NASA Peer Review Services, Code Y Precipitation Measurement Mission Proposals 500 E Street, SW, Suite 200 Washington, DC 20024-2760 Fax: 202-479-0511 **Electronically**: Enter the requested information through SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/ (see Appendix E).**
Submit Proposals to:	NASA Peer Review Services, Code Y Precipitation Measurement Mission Proposals 500 E Street, SW, Suite 200 Washington, DC 20024-2760 (For overnight delivery purposes only, the recipient telephone number is 202-479-9030)
Number of Copies Required:	20
Selecting Official:	Dr. Jack A. Kaye,Director Research Division Office of Earth Science NASA Headquarters
Obtain Additional Information From:	Dr. Ramesh Kakar, TRMM Program Scientist Code YS NASA Headquarters 300 E Street, SW Washington, DC 20546 TEL: (202) 358-0240 FAX: (202) 358-2770 EMAIL: ramesh.kakar@hq.nasa.gov

Please use identifier number NRA-02-OES-05 when making an inquiry regarding this Announcement. Your interest and cooperation in participating in this effort are appreciated.

ORIGINAL SIGNED BY

_____ Date:_____

Dr. Ghassem Asrar
Associate Administrator for
Earth Science

NASA RESEARCH ANNOUNCEMENT

RESEARCH OPPORTUNITIES FOR PRECIPITATION MEASUREMENT MISSIONS

Appendix A: Technical Description

This Announcement seeks scientific investigations in the Earth sciences discipline of precipitation science. The research program will focus on scientific investigations related to satellite observations of precipitation using measurements from, but not limited to, the Tropical Rainfall Measuring Mission (TRMM) launched in November 1997, and on investigations related to future precipitation missions, such as the next generation constellation-based Global Precipitation Measurement (GPM) Mission, now in its formulation phase. This program will focus on research topics related to the measurement of global precipitation afforded by satellite observing systems, the use of this measurement for understanding the global water cycle, and concomitant improvements in simulations of weather, climate, and hydrological processes in the context of a global precipitation measurement capability.

This research activity will utilize satellite observations and products associated with a number of research missions and operational sensors. The major focus of the expected research will be on the TRMM research mission, but could also involve observations from other research sensors such as the EOS-class Advanced Microwave Scanning Radiometer (AMSR-E) on NASA's Aqua satellite (launched in May, 2002) and a similar AMSR to fly on Japan's Advanced Earth Observing Satellite-II (ADEOS II) to be launched in late 2002. Operational sensors, such as the Special Sensor Microwave/Imager (SSM/I) and others, could also be used to provide information to complement scientific investigations.

TRMM Overview

TRMM is a joint satellite development program of the National Aeronautics and Space Administration and the National Space Development Agency of Japan (NASDA). TRMM was launched aboard a Japanese H-II rocket at an orbit altitude of 350 km and an orbit inclination of 35 degrees. Currently the satellite is functionally nominally. Originally designed as a 3-year mission, TRMM has exceeded all design expectations and, with the August, 2001 orbit boost to 402 km now has a potential lifetime of several additional years (for safety reasons NASA may deorbit the satellite before the fuel reaches a critical level).

TRMM is the first satellite mission dedicated to measuring tropical and subtropical rainfall through use of passive microwave, active microwave, and optical-infrared sensors, and includes the first deployment of an Earth-viewing spaceborne rain-radar. TRMM has made significant progress in establishing a more accurate climatology of tropical rainfall and has developed new products involving the combination of precipitation information from radar and radiometer instruments. TRMM data are also being used to calibrate data from older SSM/I satellites as well as new Aqua satellite-based precipitation estimates, which will enable the generation of a nearly 2-decade satellite precipitation record. Moreover, use of TRMM measurements in conjunction with information from other satellites has recently enabled multi-satellite products at daily and 3-hour time scales. TRMM objectives and accomplishments can also be found in a special combined publication of the 1 December 2000 issue of the Journal of Climate and Part 1 of the December 2000 issue of the Journal of Applied Meteorology.

Since tropical rainfall comprises more than two thirds of global rainfall, it is the primary distributor of heat through the general circulation of the atmosphere. Understanding rainfall and its variability is crucial to understanding and predicting global climate change, the behavior of weather systems, and the cycling of water through the atmosphere and surface. Based on past progress within the TRMM research program, current primary science objectives are: (1) to obtain and study multi-year data sets of tropical and subtropical rainfall; (2) to understand how interactions between the sea, air, and land masses produce changes in global rainfall and climate; (3) to improve modeling of tropical rainfall processes and their influence on global circulation in order to predict rainfall and variability at various periods of time; and (4) to test, evaluate, and improve satellite rainfall measurement techniques.

Future Mission Overview

The scientific successes of the TRMM program and additional satellite-focused precipitation research programs, particularly those based on use of passive microwave radiometer measurements, have paved the way for advanced precipitation measurement missions. A future, advanced mission would be designed to expand TRMM-like observations to middle and high latitudes, provide additional passive microwave sampling of global precipitation, and advance the observational capabilities and therefore significantly improve the global monitoring of precipitation. A satellite microwave constellation utilizing both research and operational satellites would be part of such a program. An advanced mission design involves a multi-member satellite constellation, one of which will be an advanced TRMM-like "core satellite" carrying a dual-frequency Ku-Ka band radar and a multifrequency passive microwave radiometer advanced from the TRMM TMI. The other members of the constellation will provide sampling support to the core satellite, with each carrying a passive microwave radiometer measuring across some portion of the 10.7-183 GHz frequency range. The constellation is expected to include a combination of dedicated research satellites and co-existing operational/experimental satellites. The ultimate goal behind the constellation concept is to achieve no worse than 3-hour microwave sampling at any spot on the globe, 90% of the time. The constellation's orbit architecture will consist of a mix of sun-synchronous and non-sun-synchronous satellites, with the core satellite providing relevant measurements on internal cloud-precipitation macro/microphysical processes. The core satellite is anticipated to be launched into an orbit configuration of ~ 400 km altitude and ~ 65 degree inclination.

Research Themes

TRMM is one of the satellite missions contributing to NASA's Earth Science Enterprise (ESE) through its measurements of tropical precipitation enhancing our knowledge of the global water and energy cycle. It is planned that a future mission will follow on with global coverage and improvement of the TRMM-based multi-satellite precipitation measurements, thus generating long-term datasets necessary for understanding the global water and energy cycle and its relationship to weather, climate, and hydrological processes. Such an understanding is a high priority research theme within ESE's scientific plan for the coming decade.

For purpose of this announcement, investigations are invited which address **focused research themes of relevance to precipitation science utilizing or related to satellite observations**

of precipitation, focusing on, but not limited to, the TRMM and future missions. A number of key topics have been suggested below under five (5) different categories to help investigators frame their proposed research.

1. Precipitation Variability and its Relationship to Climate Diagnostics & Change

Important Topics: (1) analysis of TRMM and other current satellite-based precipitation information for evidence of climatically significant precipitation variations at global and/or regional tropical scales, including inter-relations with other variables such as temperature; (2) space-time properties of precipitation variations and their relationship to variations in the climate system; and (3) development of new methodologies and requirements for observationally quantifying regional-global variations in relation to a future mission; and (4) development of new data analysis and modeling techniques for detecting accelerations in water cycling through the atmosphere and the Earth's surface.

2. Retrieval Algorithms, Validation, & Multi-satellite Precipitation Analysis

Important Topics: (1) improvement of current TRMM facility algorithms, including multi-instrument and multi-satellite algorithms; (2) development and testing of algorithms for new products related to the understanding of the cycling of water; (3) development and application of physical and statistical validation techniques and products for current satellite-based precipitation products, including development and improvement of surface-based comparison products; (4) validation of 4-dimensional latent heating structures derived from TRMM algorithm products; (5) development of a new core satellite reference algorithm and new parametric passive microwave retrieval algorithms for a constellation of diverse radiometer instruments.

3. Applications to Hydrology and Oceanography

Important Topics: (1) development and testing of hydrometeorological models simulating main terms in surface water and energy budgets (may include carbon component) under forcing by current or simulated future satellite precipitation measurements at various time scales; (2) use of satellite and field campaign data to improve and verify land surface process models and parameterizations; (3) use of current or simulated future satellite precipitation data in combination with surface flux estimates in analysis of variations of ocean salinity, ocean surface budget and parameterizations;

4. Improvements in Operational Forecast Capabilities

Important Topics: (1) development and application of satellite precipitation information for improved analysis and forecasting of tropical cyclones, floods, and other significant weather; (2) development and implementation of precipitation data assimilation strategies into operational forecast models for improved forecasts of significant weather; (3) cost/benefit analyses of current and future satellite-

based precipitation measuring systems on weather, climate, and hydrometeorological forecasting or other precipitation-based applications; (4) impact of future precipitation data sets on hydrological prediction, weather forecasting, and climate re-analysis, including improved methods for quantifying and using estimates of systematic and random precipitation measurement errors.

5. Education

Important Topics: (1) use of TRMM and other precipitation data as learning resource in K-16+ education in Earth system science and related fields; (2) development of educational projects using TRMM and other data to increase public scientific literacy about issues in global and regional water resources and role of monitoring the hydrological cycle from space; and (3) timely development and delivery of global and regional rain products suitable for applications by public and private enterprises sensitive to weather (e.g., agriculture, energy, aviation, transportation, public health, water resources, coastal management, community preparedness for natural disasters, etc.)

Specific Guidelines:

This NRA will support participation on NASA's Precipitation Science Team. Research using current and past satellite data (e.g., TRMM) and research preparation for future missions will be coordinated through this Precipitation Science Team.

Proposals should not exceed 15 pages of single-spaced pica-12 type, exclusive of references, vitae, budget information, and certificates. [Vitae should not exceed 3 pages, including publications.] A work plan, which describes the specific tasks for each year of the proposal, should be included as part of the text. Proposals should be self-contained and should not make unnecessary references to other material, such as websites on the internet. If color figures are included, they should be included in all copies provided. Attached preprints and reprints of publications and reports will be ignored in the review process.

Proposals will be subjected to both mail and panel reviews. Approved proposals will be funded in annual installments for a period of up to 3 years, subject to demonstrated satisfactory performance and the availability of funding.

In addition to the requirements of Appendix B, all proposals should include a list of other U.S. government agency support for principal investigator and any co-investigators. In cases where a proposer has other support from the NASA Office of Earth Science, a clear statement of the relationship between this proposal and other NASA funding should be provided.

APPENDIX B

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

NASA Federal Acquisition Regulation (FAR), Supplement (NFS) Part 1852.235-72 , Effective JANUARY 2000 (Modified)

(a) General.

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) Transmittal Letter or Prefatory Material.

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;

(vi) Identification of the NRA, by number and title, to which the proposal is responding;

(vii) Dollar amount requested, desired starting date, and duration of project;

(viii) Date of submission; and

(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) Restriction on Use and Disclosure of Proposal Information**.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice
Restriction on Use and Disclosure of Proposal Information

The information (data) contained in *[insert page numbers or other identification]* of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) Abstract**.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) Project Description.

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The

project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) Management Approach. For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) Personnel. The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) Facilities and Equipment.

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) Proposed Costs (U.S. Proposals Only).

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

(9) Security. Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) Current Support. For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) Special Matters.

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) Renewal Proposals.

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) Length. Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) Joint Proposals.

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or

equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g) Late Proposals. Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received.

(h) Withdrawal. Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i) Evaluation Factors.

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j) Evaluation Techniques. Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award
during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) Selection for Award.

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation.

The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA and, if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.

(3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.

(4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor; or

(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

(m) Export Control Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.

(1) U.S. proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130 and 15 CFR Parts 730-774, as applicable to the circumstances surrounding the particular foreign participation. The discussion must describe in detail the proposed foreign participation and is to include, but not limited to, whether or not the foreign participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is

available at http://www.pmdtc.org and http://www.bxa.doc.gov. Proposers are advised that under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

(n) Cancellation of NRA.

(1) NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

(End of provision)

Appendix C

Required Proposal Cover Pages

Two proposal cover pages are required as part of the proposal. The first is a **hard copy** which must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization. This authorizing signature also certifies that the proposing institution has read and is in compliance with the required certifications printed in full, therefore, these certifications do not need to be submitted separately. This page will not be counted against the page limit of the proposal.

The second proposal cover page must be submitted **electronically** to the SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/**. If the proposer has submitted an electronic Notice of Intent (Appendix E) to SYS-EYFUS, the same user UserID and password can be used to complete the electronic proposal cover page. If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user UserID and password can be used to complete the electronic proposal cover page in response to this research opportunity announcement. Be sure to click on "Edit Personal Information" if any of your correspondence information in the SYS-EYFUS is not current.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to *http://proposals.hq.nasa.gov* and performing the following steps:

1. Click the hyperlink for **new user** which will take you to the Personal Information Search Page.
2. Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
3. Confirm your personal information by **choosing** the record displayed.
4. Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS Web site and follow the instructions for **New Proposal Cover Page.**

Proposers without access to the Web or who experience difficulty in using this site may contact the Help Desk at proposals@hq.nasa.gov (or call 202.479.9376) for assistance. After you have submitted your notice of intent or proposal cover page electronically, if you are unsure if it has been successfully submitted, do not re-submit. Please call the Help Desk. They will be able to promptly tell you if your submission has been received. Please note that submission of the electronic cover page does not satisfy the deadline for proposal submission.

Proposal Cover Page

Proposal Number: _____

Date: __/___/_____

Name of Submitting Institution: **Congressional District:**

Proposal Title:	
Name of Submitting Institution:	**Congressional Distinct:**

Certification of Compliance with Applicable Executive Orders and US Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to this Research Announcement, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the two Certifications contained in this NRA [namely, (i) *Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs, and (ii) Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

WILLFUL PROVISION OF FALSE INFORMATION IN THIS PROPOSAL AND/OR ITS SUPPORTING DOCUMENTS, OR IN REPORTS REQUIRED UNDER AN ENSUING AWARD, IS A CRIMINAL OFFENSE (U.S. CODE, TITLE 18, SECTION 1001).

NASA PROCEDURE FOR HANDLING PROPOSALS

THIS PROPOSAL SHALL BE USED AND DISCLOSED FOR EVALUATION PURPOSES ONLY, AND A COPY OF THIS GOVERNMENT NOTICE SHALL BE APPLIED TO ANY REPRODUCTION OR ABSTRACT THEREOF. ANY AUTHORIZED RESTRICTIVE NOTICES THAT THE SUBMITTER PLACES ON THIS PROPOSAL SHALL ALSO BE STRICTLY COMPLIED WITH. DISCLOSURE OF THIS PROPOSAL FOR ANY REASON OUTSIDE THE GOVERNMENT EVALUATION PURPOSES SHALL BE MADE ONLY TO THE EXTENT AUTHORIZED BY THE GOVERNMENT.

PRINCIPAL INVESTIGATOR NAME:		AUTHORIZED ƧTITUTIONAL OFFICIAL NAME:	
ORGANIZATION:		ORGANIZATION:	
DEPARTMENT:		DEPARTMENT:	
MAILING ADDRESS:		MAILING ADDRESS:	
CITY, STATE ZIP:		CITY, STATE ZIP:	
TELEPHONE NUMBER:		TELEPHONE NUMBER:	
FAX NUMBER:		FAX NUMBER:	
EMAIL ADDRESS:		EMAIL ADDRESS:	
PRINCIPAL INVESTIGATOR SIGNATURE:	_____	AUTHORIZED INSTITUTIONAL OFFICIAL SIGNATURE:	_____
DATE:	_____	DATE:	_____

CO-INVESTIGATOR:

NAME	TELEPHONE	EMAIL	INSTITUTION	ADDRESS

Budget:

Year	**Budget**
1	
2	
3	
Total	

Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or posession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognizes and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear on the Proposal Cover Sheet above are authorized to sign on behalf of the Applicant.

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES
REGARDING LOBBYING AND DEBARMENT & SUSPENSION

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must **certify** that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant **certifies** to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

APPENDIX D

BUDGET SUMMARY

For period from _____ to _____

- Provide a complete Budget Summary for year one and separate estimated for each subsequent year.
- Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
- Provide as attachments detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost. See *Instructions For Budget Summary* on following page for details.

		NASA USE ONLY	
	A	**B**	**C**
1. Direct Labor (salaries, wages, and fringe benefits)	_____	_____	_____
2. Other Direct Costs:			
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. Indirect Costs*	_____	_____	_____
4. Other Applicable Costs	_____	_____	_____
5. SUBTOTAL--Estimated Costs	_____	_____	_____
6. Less Proposed Cost Sharing (if any)	_____	_____	_____
7. Carryover Funds (if any)			
a. Anticipated amount : _____			
b. Amount used to reduce budget	_____	_____	_____
8. Total Estimated Costs	_____	_____	XXXXXXX
9. APPROVED BUDGET	XXXXXX	XXXXXXX	_____

***Facilities and Administrative Costs.**

INSTRUCTIONS FOR BUDGET SUMMARY

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.

2. Other Direct Costs:
    a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    c. Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
    d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
    e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
    f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.

3. Indirect Costs*****: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.

4. Other Applicable Costs: Enter total explaining the need for each item.

5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.

6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.

7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).

8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

* Facilities and Administrative (F&A) Costs

APPENDIX E

Notice of Intent to Propose

In order to plan for a timely and efficient peer review process, *Notices of Intent* (NOI's) to propose are strongly encouraged by the date given in this NRA. The submission of a NOI is not a commitment to submit a proposal, nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/**.

User identifications (IDs) and passwords are required by NASA security policies in order to access the SYS-EYFUS Web site.

If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user UserID and password can be used to complete the electronic Notice of Intent to Propose in response to this research opportunity announcement.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to *http://proposals.hq.nasa.gov* and performing the following steps:

5. Click the hyperlink for **new user** which will take you to the Personal Information Search Page.
6. Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
7. Confirm your personal information by **choosing** the record displayed.
8. Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS Web site and follow the instructions for **New Notice of Intent.**

At a minimum, the following information will be requested:

- NRA number, alpha-numeric identifier, (Note: this may be included on the Web site template);
- the Principal Investigator's name, mailing address, phone number, and E-mail address;
- the name(s) of any Co-Investigator(s) and institution(s) known by the NOI due date;
- a descriptive title of the intended investigation; and,
- a brief description of the investigation to be proposed.

A separate NOI must be submitted for each intended proposal.